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ABSTRACT

Differences between black, anglo and chicano male and female adolescents were studied to determine the extent to which these differences are associated with differences in attitude toward mathematics, parental influence, peer influence, and societal influence. Findings supported the conclusions of similar studies with the exception of a more significant mother influence on student attitudes. Sex was found to be a non-significant factor while race was a significant variable. (JD)

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COVER SHEET

Title: A Study of Sex-Related Differences in Mathematics Achievement of Black, Chicano, and Anglo Adolescents

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ABSTRACT

OBJECTIVE

The objective was to explore mathematics achievement differences among and between black, anglo and chicano male and female adolescents and the extent to which these differences are associated with differences in attitude toward mathematics, parental influence, peer influence, and societal influence.

PERSPECTIVES

Most related literature indicates sex related differences in the study of mathematics, and in selection of occupations requiring mathematics; these differences almost always favor the male. However, virtually all of the literature has been gathered from a population that is not representative of the influences on the population of adolescents, e.g., with one exception, all studies have involved white, middle class subjects. Only one study related to blacks, and none related to chicanos. The present study, therefore, set a precendent in that it involved black, anglo, and chicano adolescents from all socio-economic levels.

METHODS (PROCEDURES) AND DATA SOURCE

The study was conducted in a large school district in the Houston, Texas metropolitan area whose clientele is composed of substantial numbers of three ethnic groups, i.e., black, anglo, chicano.

A sample of twenty-five subjects were randomly selected from each of the following groups: eighth grade black, anglo and chicano males; eighth grade black, anglo and chicano females; eleventh grade black, anglo and chicano males; and eleventh grade black, anglo and chicano females; for a total of 300.

Each of the eighth grade subjects was administered the Iowa Test of Basic Skills in mathematics, while each eleventh grade subject was administered the Stanford Test of Academic Skills in mathematics. Raw scores were used in the analysis.

Additionally, each subject was administered the Aiken and Dreger Revised Math Attitude Scale along with the Fennema-Sherman Scales, e.g., Mother/Father Influence, Math As A Male Domain and Mathematics Usefulness.

A linear multiple regression model using techniques of Kerlinger and Pedhazur as outlined in Multiple Regression in Behavioral Research was used to test the hypotheses.

Consequently, a set of research questions were posed, and corresponding hypotheses generated. To clarify the mathematical statements to be made, the control variable, grade, is denoted by c, the categorical variables of sex and ethnicity denoted as a set by f, the predictor variables of Mother Influence, Father Influence, Male Domain, Usefulness, and Attitude denoted as a set by p, and the interaction terms of predictor variables X categorical variables as a set by i. The dependent variable of achievement is denoted by y. Using multiple regressions to calculate R^2's in this manner and using the F test to evaluate the statistical significance of increments to predict is a powerful method of analysis.

FINDINGS

Questions 1. Is the proportion of variance in achievement accounted for by the full model statistically significant and/or meaningful? The corresponding research hypothesis and associated F ratio test is:

$$H_o L: \; R^2_{y.cfpi} - R^2_{y.c} = 0; F = \frac{(R^2_{y.cfpi} - R^2_{y.c}) \,/\, (24 - 1)}{(1 - R^2_{y.cfpi}) \,/\, (300 - 24 - 1)}$$

This question was asked for completeness, since it was assumed form the literature review and design of the research problem that the variables would explain a significant amount of variance.

Analysis indicated that approximately 38% of the variance was accounted for by the full equation and the F value indicated a significance at the .01 level. The hypothesis was not accepted.

Question 2. Is there a significant interaction between the predictor variables and the categorical variables?

$$H_o2: \; R^2_{y.cfpi} - R^2_{y.cfp} = 0; F = \frac{(R^2_{y.cfpi} - R^2_{y.cfp}) \; / \; (24 - 9)}{(1 - R^2_{y.cfpi}) \; / \; (300 - 21 - 1)}$$

Analysis indicated that approximately 6% of the variance was accounted for by the interaction, and the F value produced a significance at the .05 level. The hypothesis was not accepted.

Since H_o2 was found to be significant, the following separate equations were calculated:

$$H_o3: \; R^2_{y.cfpi_{sex}} - R^2_{y.cfp} = 0, \text{ and } H_o4: \; R^2_{y.cfp_{race}} = 0; \text{ e.g.,}$$

were the categorical variables significantly different from each other? In analyzing H_o3 and H_o4 it was found that sex was an insignificant contributor to the variance (approximately 1%) while race contributed approximately 5% of the variance with a significance at the .01 level.

Given the analysis of H_o3, it was appropriate to ascertain the contribution of the predictor variables beyond that accounted for by the categorical variable, e.g.,

$$H_o5: \; R^2_{y.cfp} - R^2_{y.cf} = 0.$$

The analysis of H_o5 revealed that the five predictor variables together contributed approximately 18% of the variance, ($p < .01$). However, of the five, only Male Domain and Mother Influence contributed significantly ($p < .01$).

Discussion

Most of the findings of this study support the findings of similar studies, although in studies by Fennema and Sherman, Father Influence was a significant contributor, whereas in the present study Mother Influence was significant while Father Influence was not. Surprisingly, sex was found to be a non-significant variable.

The finding that race was a significant contributor to variance in mathematics achievement cannot be compared to previous studies, since no such studies have been reported. It is felt, however, that the findings regarding race as a significant contributor, sets a precedent in studies of this nature.